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A REVISION OF THE NEOTROPICAL GENUS *XESTOBLATTA*
HEBARD (ORTHOPTERA; BLATTIDAE; PSEUDOMOPINAE).

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Of the rich blattid fauna of tropical America there are few groups of more striking appearance and none of more remarkable abdominal specialization in the males than the genus *Xestoblatta* Hebard. During recent years James Zetek, of the Bureau of Entomology and Plant Quarantine Laboratory in the Canal Zone, Panama, has made several valuable collections of roaches in connection with the trapping of trypetid fruit flies. The resulting material of *Xestoblatta* includes such interesting additions to the genus, and the collections of the United States National Museum and the Academy of Natural Sciences of Philadelphia have the species so completely represented, that a revision appears to be justified.

The author is greatly indebted to Mr. Zetek for his interest in making the collections mentioned, which contain all the known Panamanian species of *Xestoblatta*. J. A. G. Rehn has very kindly made specimens of the genus in the collection of the last-named institution, including the collection of Morgan Hebard, available for study and has given personal advice freely. All the previously known species are in the Philadelphia collections, including the types of seven species.

Of the 20 species here treated, the males of only 3 (*castanea*, *poecila*, and *sancta*) are unknown. Of these *castanea* and *poecila* may be easily identified because of their distinctive color. In this paper 8 species are described as new and the males of two other species are described for the first time. Aside from their great taxonomic value, the male genitalia and tergal specializations show much regarding the evolutionary development of the species, and the structures illustrated may interest students other than those engaged solely in the systematic study of Blattidae.

Specimens of *Xestoblatta* are rare in collections, and until the recent work with traps in Panama a series of scarcely any species was available for study. A total of 88 specimens is recorded in this paper, 57 being in the National Museum and the remainder in the Philadelphia collections. The holotypes of 16 species

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have been studied, of which 9 are in the National Museum. About 20 additional specimens in the two collections have not been recorded here because their broken condition, or the absence of males, does not permit proper characterizations of the species. It is clear that several additional species of *Xestoblatta* occur in tropical America.

The morphological terms used in this paper are essentially those of current taxonomists except that the first abdominal tergum is not called the "median segment" as has frequently been done. There are 10 abdominal terga, the supra-anal plate being the tenth, and the tergum bearing the conspicuous pit, as in *festae* for instance, is tergum 7 rather than 6.

In taxonomic literature the entire dorsal or ventral plate of an abdominal segment is frequently termed a tergite or a sternite, respectively. The author follows Snodgrass (1935, pp. 70-82) in referring to these entire plates as terga and sterna, tergites and sternites being preferred for subdivisions of the former. Snodgrass (1937) has described the male genitalia of roaches and his paper may be consulted for illustrations of phallomeres and other structures. Fig. 1, taken from Hebard (1916), illustrates the terminology of wing veins.

The recorded material shows that *Xestoblatta* is distributed from Costa Rica to Peru and southeastern Brazil; the additional specimens mentioned above extend the distribution farther, and it doubtless will be many years before we arrive at a nearly complete picture of the distribution of the group. Eight species are known from Panama and five from Colombia; two occur in both countries. The addition of Pará, Brazil, to the distribution of *immaculata* suggests that as larger collections become available, including males to make identifications positive, certain species will be found to extend over very wide areas. The receipt of two species, *ramona* and *braziliae*, from southeastern Brazil, suggests the richness of the now little known Brazilian fauna of *Xestoblatta*.

Little biological information concerning the species of *Xestoblatta* is available. All eight of the species in Panama have been taken in fruit-fly traps baited with sweet, fermenting solutions, and these roaches are undoubtedly active flyers.

The modifications of the terga of several species of *Xestoblatta* are the external portions of secretory glands, together with the structures associated with them. Such glands occur in several subfamilies of roaches and are frequently encountered in the Pseudomopinae, where they are often of a definite type in all the species of a genus, specific differences frequently being present. In some species of *Periplaneta*, no external specialization of the terga occurs, but during life eversible glands may be protruded from between certain terga (see Snodgrass, 1937), p. 55). The males of *Blattella germanica* (L.) have well developed

external organs, and Wille (1920) and others have described how the female is attracted by the odor of the secretion and applies her mouth parts to the organs during the preliminary phases of the copulatory process. It is probable that the glands of *Xestoblatta* have a similar function.

As early as 1908 (Shelford, pp. 3, 11) the dorsal openings of glands were utilized in defining blattid genera, and the taxonomic use of these structures has now been developed to a high degree (see Hebard, 1916; Ramme, 1923, p. 101; Rehn, 1926, p. 2, 1931, pl. 34).

The Genus *XESTOBLATTA* Hebard.

Xestoblatta Hebard, Trans. Amer. Ent. Soc., Vol. 42, p. 370, 1916 (genotype, *X. carrikeri* Hebard, by original designation).

Xestoblatta is a member of the group Ischnopterites of the subfamily Pseudomopinae. The genus is in the main a rather distinct aggregate, and most species may be readily placed generically. The marginal field of the tegmen is often conspicuously pale in color, superficially much as in *Periplaneta australasiae* (F.) of the subfamily Blattinae; and this feature, together with the frequent large size of the species, which are among the largest of the Pseudomopinae, usually indicates *Xestoblatta*.

Hebard (1916, 1921b, p. 124) has defined *Xestoblatta* and little change in generic limits has occurred. Important generic characters are as follows: Disk of pronotum without sulci; tegmina and wings fully developed; discoidal sectors of tegmen longitudinal; discoidal vein of wing conspicuously forked at middle or just beyond; ulnar vein with or without incomplete rami; intercalated triangle large and distinct; front femur with ventro-anterior margin armed with heavy spines throughout, the latter decreasing gradually in size apically; front femur with three apical spines (see fig. 2); ventral margins of middle and hind femora armed with moderately numerous, heavy, elongate spines; middle and hind femora each with a single, elongate, genicular spine; arolia present between equal tarsal claws; pulvilli on first four tarsal segments; male abdominal terga specialized or not.

It is difficult to present constant characters for the separation of *Xestoblatta* from *Symploce* Hebard. The latter genus, defined by Hebard (1916, 1917), is, in the New World, most abundantly represented in the West Indies, where *Xestoblatta* is not known to occur. The general appearance of most species of *Symploce* is more delicate, the size is usually considerably smaller, specializations of the males are usually of a different type from those of *Xestoblatta*, and it is clear that a group of species worthy of

separation from those of *Xestoblatta* are involved. Rehn (1933, pp. 426-427) has pointed out the difficulties in finding infallible characters for the separation of genera and he has found that even *Blattella* Caudell, which currently has been placed in the group Blattellites distinct from the Ischnopterites, lacks definite characters for separating all species from those of *Symploce*, though the genotypes do not suggest any such difficulty.

The genus *Ischnoptera* Burmeister, to which early authors assigned species of *Xestoblatta*, is more easily separated than *Symploce*. The presence of oblique pronotal sulci, the absence of a conspicuous fork in the discoidal vein of the wing, the spines of the anterior margin of the front femur abruptly differentiated into heavy and piliform types, and the differently specialized abdominal terga of the male are important characters of *Ischnoptera* separating it from *Xestoblatta*.

The African genus *Euandroblatta* Rehn (see Rehn, 1922, p. 31) is a member of the stock including *Symploce* and *Xestoblatta*, but differs from the latter in the unbranched discoidal vein and very unequal tarsal claws.

When Hebard (1916) established *Xestoblatta*, one new species (*carrikeri*) was described and *Ischnoptera nyctiboroides* Rehn, *festae* (Griffini), and *sancta* and *hamata* Giglio-Tos were transferred to it. In 1920 Hebard described *immaculata* and later (1921b) added considerable to the knowledge of the genus and described two new species (*micra*, *poecila*); he also proposed the name *hoplites* for the male identified in 1916 as *festae*. The species *castanea* has since been described and the name *para* proposed for the male previously identified as *nyctiboroides* (Hebard, 1926). Rehn (1932) definitely referred *Ischnoptera peruana* Saussure 1862 to *Xestoblatta*.

From a study of general habitus, color, number of rami of ulnar vein, male subgenital plate, paraprocts, and tergal specialization, it is seen that several developmental stocks are represented in *Xestoblatta*. On the basis of tergal specialization *carrikeri*, *zeteki*, *ecuadorana*, *micra*, *peruana*, *potrix*, *mira*, *panamae* and *festae* may be arranged in that linear sequence. The species *buscki* is clearly very close to *festae*, on account of the type of subgenital plate, but the tergal specialization of *buscki* suggests affinities with the *braziliae-ramona* stock. Reference to the figures of the male structures will show the undoubtedly close relationship of *zeteki*, *ecuadorana*, *micra* and *peruana*. Other groups are *para* and *nyctiboroides*, and *hoplites*, *sancta* and *hamata*; the last-named group is not so closely knit on the basis of tergal and genitalic specialization, but the relationship is shown by the number of rami of the ulnar vein and the proportions of the interocular area. There is no close relative of *immaculata* and the exact positions of *poecila* and *castanea* are uncertain without males. The discovery of addi-

tional species may bridge gaps between species and species groups.

The following key should be used only as an aid. The structures of the male are the most important characters in recognizing the species. It is not possible at present to prepare a working key to the females of all species. Because of the condition of certain specimens, too much reliance should not be placed on the colors and measurements in the formal descriptions which follow the key. Body length varies with the degree of extension of the abdominal segments and in some species there is apparent variation in width of pronotum due to drying to different degrees of convexity following removal from alcohol, even though passed through xylol to prevent shrinkage. Structural characters are by this method excellently preserved, but certain colors, as those of the compound eyes or the color of the mesal area of the pronotum, may vary in different individuals of the same species.

KEY TO THE SPECIES OF *Nestoblatta*.

1. Pronotum having a definite pattern formed by pale margins in striking contrast to the disk (figs. 5-8) 2
 Pronotum without so definite a pattern and without conspicuous pale margins as above 6
2. Disk of pronotum dark, marked centrally with a definite pale design (fig. 5) (Colombia)..... *poecila* Hebard
 Disk of pronotum dark, without pale central design..... 3
3. Pale lateral margins of pronotum separated from dark disk by an evenly curved line (fig. 8), dark area of disk ovate; right stylus of male subgenital plate at least four times as long as basal width (figs. 31, 30)..... 4
 Pale lateral margins of pronotum separated from disk by an irregularly curved line (figs. 6, 7), dark area of disk roughly bell-shaped; right stylus not more than twice as long as basal width (figs. 37, 40)..... 5
4. Left stylus of male subgenital plate about one-half as long as right stylus (fig. 31); pronotum with pale border extending along anterior margin (fig. 8) (Northern Brazil) *para* Hebard
 Styli subequal in length (fig. 30); pale border of pronotum interrupted anteriorly (British and French Guiana)..... *nyctiboroides* (Rehn)
5. Pronotum with dark area extending to a sharp point at anterior margin (fig. 6); male specializations as illustrated (figs. 26, 37, 59, 71) (Southeastern Brazil)..... *ramona*, new species
 Dark area of pronotum with a broad anterior extension (fig. 7); male specializations (figs. 9, 21, 40, 58) not as above (Southeastern Brazil)..... *braziliae*, new species
6. Head, pronotum and tegmina very deep chestnut brown, practically black. (French Guiana)..... *castanea* Hebard
 Coloration not nearly so dark as above..... 7

7. Male with tergum 7 (fig. 23) with a bilobed glandular pit, which is not covered by overlapping lobe of fifth tergum; left stylus (fig. 17) short; size small for genus (pronotum of only known female 3.9 mm. long, tegmen 15.6 mm.) (Colombia).....*micra* Hebard
Tergum 7 without unconcealed pit, or, if present (as in *peruana*), the left stylus is (fig. 35) long; size larger (males known in all species except *sancta*, of which the pronotum of the female is 4.5 mm. or more in length, the tegmen at least 20 mm.)..... 8
8. Ulnar vein of wing with less than 9 branches, usually not more than 6..... 9
Ulnar vein of wing with 9 or more branches.....17
9. Fifth tergum of male having a prominent posterior lobe (figs. 14, 20, 22, 25).....10
Fifth tergum of male without posterior lobe (figs. 12, 15, 19, 26).....13
10. Right stylus of male complex, with several sharp projections (figs. 32, 34, 39).....11
Right stylus simple (figs. 33, 44) or with one lateral tooth (as in some specimens of *festae*).....12
11. Right stylus (fig. 34) with appendages, which are much longer than left stylus (Panama).....*mira*, new species
Right stylus (fig. 39) with appendages shorter than left stylus (Panama).....*panamae*, new species
12. Male with right stylus a continuation of a lobe of the subgenital plate, no clear line of demarcation (fig. 33); subgenital plate without conspicuous furcate projection between styli (Panama)....*potrix*, new species
Right stylus distinct from subgenital plate (fig. 44); subgenital plate with conspicuous furcate projection between styli (Panama, Colombia).....*festae* (Griffini)
13. Male subgenital plate with conspicuous projection between styli (fig. 42) (Panama).....*buscki*, new species
Male subgenital plate without projection between styli (figs. 16, 24, 29, 35).....14
14. Left stylus of male minute, much shorter than right stylus (figs. 16, 29).....15
Left stylus about as long as right stylus (figs. 24, 35).....16
15. Right stylus of male evenly curved dorsally (fig. 29); posterior margin of right paraproct broadly angulate (fig. 61) (Panama)....*zeteki*, new species
Right stylus unevenly curved (fig. 16); posterior margin of right paraproct not angulate (fig. 62) (Ecuador).....*ecuadorana*, new species
16. Right stylus with subapical dorsal thorn (fig. 24) (Colombia).....*carrikeri* Hebard
Right stylus with simple acute apex (fig. 35) (Peru)....*peruana* (Saussure)
17. Male with first abdominal tergum conspicuously specialized (fig. 13); interocular space (fig. 4) much wider at occiput than at junction with interocellar area; pronotum and all except marginal field of

- tegmina uniformly pale brownish-yellow (Panama, northern Brazil).....*immaculata* Hebard
- Male, where known, not with first tergum strikingly specialized; interocular space (fig. 3) narrower at occiput than at junction with interocellar area; coloration not as above.....18
18. Disk of pronotum with lateral patches of dark buff well developed, giving an appearance such as frequently occurs in *Epilampra*; size of female medium for genus (male unknown), pronotum not known to exceed 5 mm. in length or tegmen 22 mm. (Ecuador)....*sancta* (Giglio-Tos)
- Buff patches not so well developed, pronotum not suggesting *Epilampra* so strongly; size of female larger, pronotum and tegmen exceeding above measurements.....19
19. Left lateral margin of subgenital plate armed with three spines (fig. 43) (Costa Rica).....*hoplites* Hebard
- Left lateral margin of subgenital plate not armed with spines (fig. 41) (Panama, Colombia, Gorgona Island).....*hamata* (Giglio-Tos)

Xestoblatta para Hebard.

Figs. 2, 8, 10, 31.

Xestoblatta nyctiboroides Rehn (in part), Hebard, Trans. Amer. Ent. Soc., Vol. 42, pp. 373-374, pl. 19, figs. 1-4, 1916.

Xestoblatta para Hebard, Proc. Acad. Nat. Sci. Phila., Vol. 78, p. 184, 1926.

Hebard's type was first recorded as *nyctiboroides* (1916, p. 373) and later by Rehn (1918, p. 156). The latter (1932, p. 30) has since recorded four males and two females under the name of *para*. Like *nyctiboroides*, this is one of the small, dark species of the genus with distinct pale pronotal margin. In *nyctiboroides*, however, the pale margin does not extend along the entire anterior margin and the male styli differ decidedly. In the male type of *para* the ulnar vein of the wing has one ramus reaching the tip of the wing; in the female there are two complete rami and one very short, incomplete ramus.

Material examined:¹ Igarapé Assu, Pará, Brazil, January 23, 1912 (H. S. Parish), 1 male (type); Rio Purus, Amazon, Brazil, January (Roman), 2 males, 1 female.

Xestoblatta nyctiboroides (Rehn).

Fig. 30.

Ischnoptera nyctiboroides Rehn, Proc. Acad. Nat. Sci. Phila., Vol. 57, pp. 266-267, 1906.

This species was placed in *Xestoblatta* by Hebard (1916) at the time the genus was established. It was confused with *para*, as

¹ The material of this and the following species recorded under this heading belongs to the Philadelphia collections unless marked by U. S. N. M., in which case it belongs to the U. S. National Museum.

discussed under that species, until Hebard (1926) recognized the distinctness of the two forms and identified the male recorded below as *nyctiboroides*. It is possible that this male does not belong to *nyctiboroides*, but any more definite association of sexes must await the receipt of more material. The supposed male has two complete rami of the ulnar vein; there are no incomplete rami.

Material examined: Demerara, British Guiana, 1901 (R. J. Crew), 1 female (type); Nouveau Chantier, French Guiana (Le Mout), 1 male.

***Xestoblatta poecila* Hebard.**

Fig. 5.

Xestoblatta poecila Hebard, Trans. Amer. Ent. Soc., Vol. 47, pp. 124-125, pl. 9, fig. 18, 1921.

This species is distinct and readily recognizable by the pattern of the pronotum. It is a medium-sized species (length of pronotum 4.9 mm.), whose coloration suggests relationship to the *para-nyctiboroides* stock.

Material examined: Villavicencio, Intendencia del Meta, Colombia, 1400 ft., December, 1918, 1 female (type).

***Xestoblatta carrikeri* Hebard.**

Figs. 1, 11, 24.

Xestoblatta carrikeri Hebard, Trans. Amer. Ent. Soc., Vol. 42, pp. 374-376, pl. 19, figs. 5-7, 1916.

This, the genotypic species, is known only from the originally described pair, it was later listed by Hebard (1919) in the first paper of his studies on the Dermaptera and Orthoptera of Colombia.

The male styli are as in fig. 24 in caudal view. The left stylus is curved and tapers slightly to the blunt, somewhat enlarged apex; the right stylus has a moderate mesal swelling and a heavy dorsal thorn near the apex.

Material examined: Cincinnati, Santa Marta, Colombia, 4,500 ft., July 10, 1913 (M. A. Carriker, Jr.), 1 male (type), 1 female (allotype).

***Xestoblatta zeteki*, new species.**

Figs. 12, 29, 52, 61.

The nearest relatives of *zeteki* are *micra* and *peruana*; the species may be readily distinguished by the male characters illustrated.

Male (holotype).—Size medium to small for the genus; tegmina and wings extending beyond apices of cerci. Lateral margins of interocular space feebly diverging posteriorly, nearly parallel; width at vertex 0.8 mm., slightly narrower than distance between ocellar spots.

Wing with three complete rami and one incomplete one of ulnar vein. Abdomen specialized dorsally as in fig. 12; sixth tergum broadly emarginate; seventh with postero-lateral angles produced, a deep transverse glandular depression located medially; eighth tergum simple, nearly concealed by seventh; ninth with posterior margin broadly rounded, the postero-lateral angles conspicuously developed; supra-anal plate as illustrated, apex entire. Subgenital plate in ventro-caudal view as in fig. 29; left stylus minute; right stylus curved, tapering to a very fine point, borne on an incurved flap of subgenital plate. Left paraproct (fig. 52) bearing a hook with two well separated curved apical teeth. Right paraproct (fig. 61) in the form of an uneven plate, broadly angulate posteriorly, its meso-posterior angle forming a single tooth.

Coloration: Pronotum honey yellow; disk with darker patches on each side of mesal area. Tegmen amber, paler along costal margin and light yellow in marginal field, a darkened metallic luster conspicuous on posterior half. Wing transparent, pale buff, membrane darker anterior to axillary vein. Interocular area golden yellow. A distinct transverse band connecting antennal sockets darkened at extremities, feebly developed medially. Frontal pits each marked with a small spot of dark brown; remainder of head pale. Fourth and fifth segments of maxillary palpus pale brown; other segments pale. Antenna brown, paler near base. Legs pale; tibiae somewhat darker, with brown at bases of spines; each coxa with three weak brown spots, one near lateral margin about one-third the distance from base, one near apex in the area which receives the femur in repose, and one which is inconspicuous at base. Abdomen with terga 1-5 pale at bases, grading into dark brown, then narrowly margined posteriorly with yellow; terga 6-7 not so dark except near lateral margins; eighth and ninth terga pale brown; supra-anal plate yellow with white apical triangle and narrow basal areas of brown at its union with intersegmental membrane. Ventral surface of abdomen honey yellow, somewhat paler along lateral margins. Cerci dark brown ventrally, yellow dorsally. Left paraproct brown. Right paraproct yellow along lateral two-thirds of posterior margin, grading into brown on disk, which is intensified to black at mesal apex and apical tooth.

Measurements: Length of body 16.5 mm., of pronotum 4.2 mm., of tegmen 18 mm., of hind tibia 7 mm.; width of pronotum 5.8 mm.

Female (allotype).—General form as in male; width of interocular space 1 mm. Ulnar vein of wing with three complete and three incomplete rami. Abdominal terga unspecialized; subgenital plate simple, broadly rounded apically; supra-anal plate triangular, apex with small, sharp, triangular emargination.

Coloration: Differs from male as follows: Metallic luster in posterior half of tegmen darker; veins in posterior half of anal field more noticeably marked with yellow; subgenital plate uniform brown, slightly paler at lateral margins.

Measurements: Length of body 17 mm., of pronotum 4.6 mm., of tegmen 19.5 mm., of hind tibia 7.5 mm., width of pronotum 5.5 mm.

Type locality.—Barro Colorado Island, Canal Zone, Panama.

Type.—No. 53124 U. S. National Museum.

The type and allotype, the only known specimens of the species, were collected by James Zetek in a fruitfly trap at the type locality during June, 1937.

This new species is named in honor of James Zetek, who has for many years taken an active interest in the insect fauna of Panama.

***Xestoblatta ecuadorana*, new species.**

Figs. 16, 19, 50, 62.

This species is clearly of the same stock as *peruana*, from which it differs in the male genitalia. Closest relationship is shown to *zeteki*, as indicated by habitus and wing venation, and as comparison of the figures of male structures demonstrates.

Male (holotype).—General form as in *zeteki*; narrowest width of interocular area 0.7 mm.; ulnar vein with three complete and four incomplete rami. Abdominal terga as in fig. 19; sixth tergum broadly emarginate, briefly overlapping seventh; seventh with transverse oval pit; ninth with right postero-lateral angle abnormally abortive; supra-anal plate transverse, apex entire; subgenital plate as in fig. 16 in caudal view; left stylus minute, elongate-globular; right stylus tapering to a fine point, directed dorso-medially for about one-third its length, then medially, then dorso-medially again and nearly reaching to base of left cercus. Left paraproct (fig. 50) armed with three strong curved teeth. Right paraproct (fig. 62) without angular projection of posterior margin as in *zeteki* (fig. 61).

Coloration: Much as in *zeteki*, but tegmina more straw-colored and lateral patches on disk of pronotum more intensified. Compound eyes brown. Interocular area brown, paling posteriorly, the brown reaching part way onto interocellar area; facial band faint. Terga 1-7 pale at bases, brown along posterior margins except at lateral extremities; brown intensified near lateral margins, but lateral margins and lateral extremities of posterior margins pale yellow. Terga 8 and 9 brown, slightly lighter at lateral margins; supra-anal plate pale yellow, light brown basally at junction with intersegmental membrane. Sterna pale, dark spots at antero-lateral angles well developed; subgenital plate brown, pale at base of right stylus; styli and paraprocts light brown.

Measurements: Length of body 18 mm., of pronotum 4 mm., of tegmen 20.5 mm., of hind tibia 8 mm., width of pronotum 5.7 mm.

Female (allotype).—General form as in male; narrowest width of interocular area 1.2 mm.; two complete and three incomplete rami of ulnar vein.

Coloration: As in male; compound eyes very dark brown; subgenital plate light brown, yellowish along lateral margins.

Measurements: Length of body 15.7 mm., of pronotum 3.8 mm., of tegmen 18.5 mm., of hind tibia 7 mm., width of pronotum 5.7 mm.

A single female with the following data is considered a paratype: Puyo, Oriente, Ecuador, 900 meters, October 14, 1937 (E. J. Brundage, Jr.). It agrees in all essential respects with the allotype. There are two complete and

two incomplete rami of ulnar vein. The pronotum has the lateral patches little developed.

Type locality.—Banos-Mera Trail, Rio Pastaza watershed, Ecuador.

Type.—No. 53125 U. S. National Museum.

The type and allotype were taken at type locality September 22, 1937, at an altitude of 1200 meters, by E. J. Brundage, Jr.

***Xestoblatta micra* Hebard.**

Figs. 17, 23, 56, 63.

Xestoblatta micra Hebard, Trans. Amer. Ent. Soc., Vol. 47, pp. 125-127, pl. 8, figs. 12, 13, 1921.

This is one of the smallest of the light-colored species and is about equal in size to *para*, the smallest of the dark species. The right stylus of the male type is weakly sclerotized at the apex and may be somewhat longer in fresh material than fig. 17 indicates. The left paraproct (fig. 56) is armed with two teeth at the apex. The right paraproct (fig. 63) is evenly convex along the posterior margin and the postero-mesal angle is acute.

Material examined: Las Mesitas, Cundinamarca, Colombia, 3200 ft., May, 1918, 1 male (type), 1 female (allotype).

***Xestoblatta peruana* (Saussure).**

Figs. 15, 35, 57, 64.

Ischnoptera peruana Saussure, Rev. et Mag. Zool., Vol. 14, p. 169, 1862.

Nothing is known concerning Saussure's material except from his papers, and since the male genitalia are not described the present species may not be true *peruana*. It is almost certain that Saussure's species belongs to *Xestoblatta*, however, and judging from the descriptions and locality data the present identification is probably correct. When first described, *peruana* was set apart from other species of *Ischnoptera* because conspicuous pronotal sulci were not present. Saussure (1864, p. 90, fig. 12) recorded a single specimen from Peru which lacked the abdomen, and utilized the absence of sulci in placing it in natural relationship to other species. Later the same author (1870, pp. 53-56) included *peruana* among species with "humeral vein" of wing bifurcate at the middle. Thus Saussure recognized the importance of two features later used by Hebard in defining *Xestoblatta*. Brunner (1865, pp. 129, 141) listed *peruana* among his "species incertae." Hebard (1916, p. 372) mentioned *peruana* as being other than a true *Ischnoptera* and suggested the possibility of its being a member of *Xestoblatta*; Rehn (1932, p. 31) included it in the latter genus.

Male.—Size medium for genus; tegmina and wings well developed, extending well beyond apices of cerci. Interocular space 0.7 mm. wide, lateral margins nearly parallel; face even, no pronounced elevation of interocellar area as in *ramona* and *braziliae*. Ulnar vein of wing with four complete and two incomplete rami. Dorsal surface of abdomen (fig. 15) with seventh tergum specialized by the development of a glandular pit divided medially by a low median longitudinal ridge. Caudal view of subgenital plate as in fig. 35; left stylus well sclerotized, curved and slightly spiral-like at the sharp apex; right stylus less heavily sclerotized, tapering to a fine point; left paraproct (fig. 57) bearing a strong, single hook, sharply curved at apex; right paraproct (fig. 64) with sharp tapering tooth at meso-posterior angle.

Coloration: In general straw-colored; disk of pronotum somewhat darker; interocular space pale reddish-brown; coxae conspicuously spotted with brown in same places as in *zeteki*; abdominal sterna 1-6 with similar spots at antero-lateral angles and near anterior margin in each lateral fifth; subgenital plate brown, pale yellow along apical margin and along posterior halves of lateral margins; cerci brown ventrally, pale dorsally.

Measurements: Length of pronotum 4 mm., of tegmen 18.5 mm., of hind tibia 7.5 mm.; width of pronotum 5.6 mm.

Material examined: El Campamiento, Peru, June 19, 1920 (Perone) (Cornell Univ. Expedition, Lot 569), 1 male; Front. Pérou-Bolivie, Haut-Bassin de l'Amazonie, 1912, 1 female.

Xestoblatta potrix, new species.

Figs. 20, 33, 38, 45, 51, 65.

The male subgenital plate and styli of *potrix* are very different from those of other known species, but the specialization of the terga and the right paraproct show close relationship to *mira*. The supra-anal plate of *potrix* is less elongate than that of *mira*. The latter species is considerably smaller than *potrix*, and lacks a conspicuous dark facial band between the antennal sockets.

Male (holotype).—Size medium for the genus; tegmina and wings extending beyond apices of cerci. Lateral margins of interocular space slightly diverging posteriorly, width at narrowest point 0.7 mm., slightly narrower than distance between ocellar spots. Face and interocellar area smooth and evenly convex, no prominent elevation as in *ramona*.

Ulnar vein of wing with two complete rami and one rather long incomplete one, the first complete ramus forked one-third the distance from the margin of wing. Abdominal terga as in fig. 20; fifth tergum with prominent, broadly rounded, median projection overlapping sixth and seventh terga; posterior margin of sixth tergum broadly emarginate; seventh with deep, oval, glandular pit bisected longitudinally by a low ridge; eighth tergum concealed by seventh; supra-anal plate transverse, feebly emarginate at apex. Subgenital plate as in fig. 33 in caudal view; left stylus with a tuft of strong setae in part passing through the loop of a strongly curved apical hook; right stylus (fig. 38) broadly joined to subgenital plate, notched apically, convex ventrally, slightly concave

dorsally, prominent setae borne as illustrated. Left paraproct (fig. 51) bearing an elongate arm with two curved apical hooks. Right paraproct (fig. 65) especially characterized by a large, heavily armed projection extending from beneath posterior margin. Left phallomere a large, well sclerotized, strongly recurved hook. Right phallomere a sclerotized appendage extending medially, partly concealed by membrane and bearing about seven dorsal teeth.

Coloration: Of same type as *zeteki*, differing as follows: Dark lateral patches of pronotum more intensified; interocular area black, paling to honey yellow at posterior extremity of occiput; interantennal band dark brown medially, extremities pale; compound eyes pale blue (probably due to method of preservation); supra-anal plate without white apical triangle; ventral surface of abdomen somewhat darker medially grading to brown on disk of subgenital plate, sterna with dark suffusion close to lateral margins and paling posteriorly; right stylus pale brown ventrally, whitish dorsally; left paraproct with arm deep amber, brown at base and at apical hooks; right paraproct brown, whitish along mesal two-thirds of posterior margin, arm projecting from beneath paraproct amber.

Measurements: Length of body 18 mm., of pronotum 4.4 mm., of tegmen 18.7 mm., of hind tibia 7.5 mm., width of pronotum 5.6 mm.

Type locality.—Barro Colorado Island, Canal Zone, Panama.

Type.—No. 53126 U. S. National Museum.

Only the type is known; this was collected September–October, 1937, by James Zetek in a fruitfly trap.

***Xestoblatta mira*, new species.**

Figs. 18, 22, 34, 66.

This is the smallest of the light colored species of *Xestoblatta*. It is related to *potrix* and *panamae*, probably more closely to *panamae* as there are suggestions of affinities in the right styli.

Male (holotype).—General form as in *potrix*; narrowest width of interocular space 0.7 mm. Rami of ulnar vein as in *potrix* except that both complete rami are simple. Abdominal terga as in fig. 22; pit of seventh tergum proportionately smaller than in *potrix* and with faint indication of longitudinal ridge. Subgenital plate as in fig. 34 in caudal view; left stylus small and conical; right stylus borne on a recurved fold of the subgenital plate, the first ventral appendage very slender and tapering to a simple point, the second stronger and briefly forked at apex, the base of stylus heavier and armed as illustrated. Left paraproct (fig. 18) bearing an arm which forks once near base. Right paraproct armed along posterior margin as in fig. 66, with a strongly armed projection extending from ventrad of the margin. Phallomeres differing slightly from those of *potrix*.

Coloration: Differing from *zeteki* as follows: Interocular area brown, paling posteriorly; facial band feeble throughout; compound eyes pale blue; abdominal sterna with conspicuous dark spot at each latero-anterior margin; right stylus brown, first ventral appendage pale; right paraproct brown, yellowish along margin included in fig. 66.

Measurements: Length of body 16.5 mm., of pronotum 3.5 mm., of tegmen 15 mm., of hind tibia 6 mm., width of pronotum 4 mm.

Type locality.—La Campaña (near Capira), Panama.

Type.—No. 53127 U. S. National Museum.

The single type was taken by James Zetek in a fruitfly trap October–November, 1937.

***Xestoblatta panamae*, new species.**

Figs. 14, 32, 39, 53–55, 67.

Although differing markedly from *festae* in the male subgenital plate, *panamae* is closely related to that species with respect to tergal specialization, right paraproct and general habitus. Females of *festae* are smaller and differ in color of supra-anal plate, which is dark along the posterior margin and over much of the disk, while that of *panamae* is largely yellow.

Male (holotype).—Size medium; general form as in *potrix*; width of interocular area at narrowest point 9.5 mm.; ulnar vein with two complete and two incomplete rami. Abdominal terga as in fig. 14; fifth tergum with median projection overlapping sixth and seventh very much as in *festae*; posterior margin of sixth broadly emarginate medially, with blunt tooth each side of middle, each tooth bearing a tiny button-like knob; seventh with very deep glandular pit, posterior margin undulating as illustrated; supra-anal plate elongate, apex entire. Subgenital plate as in fig. 32 in ventro-caudal view; left stylus a simple tapering appendage, slightly curved near sharp apex; near left stylus and dorsad of it a short, oblong appendage is borne on margin of subgenital plate, this having two tufts of strong setae; right stylus (fig. 39) short, convex, armed with three strong teeth, borne on a twisted recurved fold of subgenital plate. Left paraproct (fig. 53) with short curved arm, bearing five short teeth. Right paraproct with clusters of small sharp teeth at caudomesal angle and near lateral extremity of posterior margin, a heavy-set cluster of teeth borne by an arm projecting from ventrad of posterior margin, the paraproct differing from fig. 67 in possessing four instead of three teeth in cluster on posterior margin.

Coloration: General coloration as in *zeteki*, but pronotum uniformly golden-yellow; tegmina of a rich deeper color than in *zeteki*, with a bluish metallic luster; compound eyes pale blue; interocular area brown, paling to yellow posteriorly, with three longitudinal stripes extending posteriorly into the yellow on the occiput; facial band poorly developed medially, obsolete at extremities; terga 2–5 with transverse area of brown each side of median line, not reaching any of the three margins, which are paler; abdominal sterna amber, somewhat darker on subgenital plate, with dark brown spots at latero-anterior angles of sterna as in *mira*. Paraprocts brown with darker teeth.

Measurements: Length of body 21.5 mm., of pronotum 4.6 mm., of tegmen 20.5 mm., of hind tibia 8 mm., width of pronotum 5.6 mm.

Female (allotype).—General form as in male; narrowest width of interocular space 1.3 mm. Ulnar vein with 3 complete rami and one incomplete ramus. Abdominal segments simple; supra-anal plate weakly emarginate; subgenital plate broadly rounded apically.

Coloration: As in male with the following exceptions: tergum 6 with similar

dark area each side, which reaches posterior margin; supra-anal plate yellow with a dark spot about as broad as width of cercus at anterior margin each side of median line, a touch of white at apex; paraprocts brown, pale yellow along posterior margins.

Measurements: Length of pronotum 4.8 mm., of tegmen 19.7 mm., of hind tibia 8 mm., width of pronotum 6.1 mm. (Abdomen detached.)

In addition to the type and allotype just described, three males and one female, of which the female abdomen is lacking and two male abdomens are detached but preserved, are considered paratypes. It is clear that the small teeth arming the left paraproct vary in number, there being five in the holotype (fig. 53), two in one paratype (fig. 55) and three in the other two paratypes (fig. 54). The number of teeth in the group borne on the posterior margin of the right paraproct is four, three, three and one, respectively. The paratypes agree with the holotype with respect to rami of ulnar vein. The pronotum of one male paratype is 6 mm. wide; the measurements do not differ from type and allotype in other respects. The interocular area of one male is a lighter shade of color and the longitudinal stripes are less distinct than in the remainder of the series.

Type locality.—Barro Colorado Island, Canal Zone, Panama.

Type.—No. 53128 U. S. National Museum.

The type, allotype and three paratypes were collected in a fruitfly trap by James Zetek, September–October, 1937. One male paratype was taken at type locality in a trap August–September, 1936. One male paratype is deposited at the Academy of Natural Sciences of Philadelphia, and one at the Museum of Zoology, University of Michigan.

***Xestoblatta festae* (Griffini).**

Figs. 25, 44, 49, 68.

Epilampra festae Griffini, Boll. Mus. Zool. Anat. Comp. Univ. Torino, Vol. 11, No. 236, pp. 2–3, 1896.

This species was originally described from a single specimen from Darien in Panama. Giglio-Tos (1898) included *festae*, together with his new *hamata* and *sancta*, in a section of *Ischnoptera* characterized by having only long spines along the anterior margin of the front femur and a furcate humeral vein of the wing.

Xestoblatta festae has been well described by Hebard (1921b, pp. 127–129, pl. 8, figs. 14–16) and may be easily recognized by the male specializations, though in other features it is hardly distinguishable from allied species. Hebard (1916) described a male as *festae* which later became the type of *hoplites*.

Allee (1926) and Hebard (1920, 1921a) have recorded specimens from Panama, and from the material at hand *festae* appears to be the commonest of the Panamanian species.

The following notes on variation are based on 12 males in the National Museum. In 11 specimens the left paraproct has

no appendage; only a small prominence, in some individuals scar-like, is present. One specimen has a simple arm tapering to a sharp apex. Fig. 47 is of a typical right paraproct. In five specimens there is a single tooth midway of the posterior margin, in two specimens two teeth, in three specimens three teeth, and one specimen has a group of four small teeth located there. In one male the sixth tergum has an abnormally developed projection each side of the median emargination. These projections are very suggestive of the structures of *panamae*.

Material examined: Barro Colorado Island, Canal Zone, Panama, December, 1936 January, 1937 (Zetek), 1 male (U. S. N. M.); June, 1937, fruitfly trap, 4 males, 2 females (U. S. N. M.); August–September, 1936, fruitfly trap, 5 males, 2 females (U. S. N. M.); (W. C. Allee), 1 female U. S. N. M.; April 5, 1924, 1 female; September–October, 1937, fruitfly trap, 3 females, 4 males (U. S. N. M.); Porto Bello, Panama, April 20, 1912 (A. Busck), 1 female (U. S. N. M.); Panama City, Panama, 1911, 1 female; Gatun, Panama, open country, July 8, 1920 (M. Hebard), 1 female; Paris Field, Cristobal, Panama, July 7, 1920 (M. Hebard), 1 male; Murindo, Choco, Colombia, November 16, 1918 (M. A. Carriker, Jr.), 1 male.

***Xestoblatta buscki*, new species.**

Figs. 36, 42, 69.

This species shows nearest relationship to *festae*, from which it differs in the male specializations and more conspicuous facial band.

Male (holotype).—Size medium for the genus; tegmina and wings well developed, extending beyond apices of cerci. Interocular space with lateral margins nearly parallel; width at vertex 0.9 mm., slightly narrower than distance between ocellar spots.

Ulnar vein of wing with two rami reaching margin, three short incomplete rami going to anal vein. Abdomen without specializations of terga except as illustrated (fig. 36); sixth tergum broadly emarginate; lateral angles of seventh tergum noticeably produced; eighth nearly concealed; supra-anal plate barely emarginate at apex. Subgenital plate in ventral view as in fig. 42; left paraproct armed with slender curved hook with three sharp teeth at apex (which has only two visible in fig. 42); left stylus gently curved, blunt at apex; right stylus borne on an incurved fold of subgenital plate, curved, acute at apex; apical margin of subgenital plate with furcate projection between styli, strongly sclerotized. Two tufts of setae, one composed of setae closely grouped together and with their tips straight, the other group arranged in a dense row and their tips hooked, projecting from beneath left paraproct. Right paraproct specialized in the form of a plate (fig. 69) and with an armed appendage projecting from beneath its caudal margin. A slender, strongly curved phallomere extending from membranous folds.

Coloration: General coloration as in *festae*, pronotum with pale yellow lateral and anterior margins grading into the mottled brown disk. Tegmen cinnamon

brown, slightly paler along costal margin and with pale yellow in marginal field; shiny, with faint metallic luster. Wing transparent, brownish buff with noticeable blackish tinge from axillary vein anteriorly; costal margin grading into yellow. Head, head appendages, legs, and dorsal surface of abdomen as in *zeteki* with the following exceptions: Interocular space brown, paling toward occiput; band between antennal sockets marked at extremities; basal coxal spot conspicuously developed. Ventral surface of abdomen pale along lateral margins, darker medially and toward apex; subgenital plate brown, with pale margins except apical forked projection. Right stylus brown. Cerci deep brown ventrally, pale dorsally excepting dark lateral margins along basal two-thirds.

Measurements: Length of body 19.5 mm., of pronotum 4.5 mm., of tegmen 19.5 mm., of hind tibia 8 mm.; width of pronotum 6 mm.

Female (allotype).—General form as in male. Interocular space 1 mm. wide, lateral margins parallel. Wing with two complete and no incomplete rami of ulnar vein. Abdomen with terga unspecialized; supra-anal plate broadly triangular, apex scarcely emarginate; subgenital plate unspecialized, broadly rounded at apex.

Coloration: Like that of male; subgenital plate brown, grading into yellow at lateral margins, dark brown at apex; on each side about one-third distance from lateral margin to median line a black spot near posterior margin of penultimate segment.

Measurements: Length of body 16.5 mm., of pronotum 4.5 mm., of tegmen 19.5 mm., of hind tibia 7.6 mm.; width of pronotum 6.5 mm.

In addition to the type and allotype described above, three specimens, two males and one female, and two male abdomens which were broken from the bodies during shipment and the remaining parts unassociated with them are considered paratypes. One male has 2 complete rami and an incomplete one of the ulnar vein; the other two complete and no incomplete rami. There are 3 complete and 1 and 2 incomplete rami of the two wings of the female paratype. The hook of the left paraproct of one of the detached abdomens has 4 teeth at the apex instead of 3 as in the other abdomens. The right paraproct of one abdomen has only 3 teeth in the basal cluster. The wings of the female paratype have 3 complete ulnar rami and 1 to 2 incomplete rami. No further variation in the paratypic material has been noted.

The separation of females from those of *festae* is somewhat uncertain, but the males differ strikingly in the features of the abdomen as shown by the figures.

Type locality.—Barro Colorado Island, Canal Zone, Panama.

Type.—No. 53129 U. S. National Museum.

One entire male paratype is deposited at the Academy of Natural Sciences of Philadelphia and one at the Museum of Zoology, University of Michigan.

All specimens were taken by James Zetek in a fruitfly trap

at the type locality in June, 1937, except one male paratype which was taken in the same place and manner September–October, 1937.

The present insect is named in honor of August Busck, the author's colleague and friend. During his field work in Panama Mr. Busck collected many species of Blattidae for the National Museum, which were studied in 1920 by Hebard at the time of the latter's classic report on the Blattidae of Panama.

***Xestoblatta ramona*, new species.**

Figs. 6, 26, 37, 59, 71.

This striking species is most closely related to *braziliae*, from which it differs in the color pattern of the pronotum and the structure of the male genitalia.

Male (holotype).—Typical in general form, well developed tegmina and wings, and light-yellow marginal field of tegmen, but size large for the genus. Head rather sharply triangular in frontal aspect. Interocular space narrow (0.6 mm.), lateral margins briefly outcurved in anterior third, slightly diverging both at occiput and at junction with interocellar area, noticeably depressed and marked with transverse wrinkles in anterior fourth. Interocellar area somewhat elevated and at a marked angle with ocellar spots. Legs typical of *Xestoblatta*. Pronotum (fig. 6) with sides somewhat hood-like, strongly sloping.

Ulnar vein with 5 complete and 5 incomplete rami. Abdomen specialized dorsally as in fig. 26; sixth tergum with a pair of hook-like folds on posterior margin; eighth tergum largely concealed by broadly produced posterior margin of seventh; supra-anal plate wide at apex, broadly and gently emarginate. Subgenital plate as in fig. 37; styli short and conical, armed dorsally with numerous, short, sharp spines. Left paraproct bearing a strong curved hook (fig. 59); a small lateral tooth near sharp apex of hook. Right paraproct hook-like, armed with blunt teeth along posterior margin as in fig. 71. Phallomeres projecting from membranous folds, the left one poorly developed and weakly sclerotized, the right one strongly sclerotized, curved and similar to the corresponding phallomere of *braziliae* (fig. 9) except that no thorn is borne at the apex.

Coloration: General color dark, except for marginal field of tegmen and margin of pronotum, which are whitish yellow. Pattern of pronotum (fig. 6) with disk black, dark brown at the point touching anterior margin; lateral margin narrowly edged with black, shading to brown anteriorly above occiput. Tegmen very dark brown, with rich metallic luster in basal half, grading to pale brown at apex, marginal field of sharply contrasting whitish yellow. Wing transparent; general color buff; veins and membrane tinged with yellow, especially along costal margin. Face black, grading to pale brown on genae, on ocellar spots, and around antennal sockets; clypeus reddish brown, yellow on each lateral third; labrum reddish brown; maxillary palpus with segments 1 and 2 dirty white, remaining segments blackish brown; antenna brown. Legs blackish brown; front coxa pale along lateral margin; all coxae with irregular pale areas near femoral joints and pale streaks in the areas receiving the femora in repose;

spines reddish brown. Abdominal terga 1-7 brown, somewhat darker along posterior margins; eighth and ninth terga pale brown; supra-anal plate slightly darker. Abdomen uniformly dark brown ventrally; dorsal surface of cerci pale medially, remainder dark brown; paraprocts dark brown; right phallomere reddish brown.

Measurements: Length of body 18.5 mm., of pronotum 5.3 mm., of tegmen 24.5 mm., of hind tibia 9.7 mm.; width of pronotum 6.8 mm.

Type locality.—Organ Mountains, Minas Geraes, Brazil.

Type.—No. 53130 U. S. National Museum.

In addition to the holotype, collected in April, 1935, there is one male paratype collected at Rio de Janeiro, Brazil, March-April, 1935. Both specimens were taken by Pauline Sandig. The paratype measures 22 mm. in length and the pronotum is 7.4 mm. wide. The right paraproct differs from that of the holotype in having only three teeth along the posterior margin; of these the lateral one is much larger than the corresponding one of the holotype.

The paratype is deposited at the Academy of Natural Sciences of Philadelphia.

***Xestoblatta braziliac*, new species.**

Figs. 7, 9, 21, 40, 58, 72.

This insect differs from the closely allied *ramona* in the pronotal pattern, the remarkable abdominal specializations of the male, and in minor color features.

Male (holotype).—General form as in *ramona*. Ulnar vein of wing with 6 complete and 6 incomplete rami. Dorsal surface of abdomen specialized as in fig. 21; sixth tergum with an obtuse angulation in each lateral third of posterior margin; seventh and ninth terga somewhat similarly modified but angulation more gradual; eighth tergum simple; supra-anal plate broadly but distinctly emarginate. Subgenital plate as in fig. 40, apex not oblique as in *ramona* (fig. 37); styli very similar to those of *ramona*; left paraproct armed with a simple, strongly curved hook (fig. 58); right paraproct (fig. 72) bearing sharp teeth along posterior margin; left phallomere well sclerotized, smooth, strongly hooked, blunt at apex; right phallomere (fig. 9) curved, covered with minute spines, apex bearing a strong thorn.

Coloration: Very similar to *ramona*. Pronotum (fig. 7) with disk nearly black, the latter with reddish tinge. Tegmen as in *ramona*. Head reddish brown; clypeus pale brown; ocellar spots pale yellow; antenna and apical 2 segments of maxillary palpus brown. Legs brown. Abdominal terga 1-5 pale brown; terga 6-9 yellowish; supra-anal plate yellowish, tinged with reddish brown. Sterna brown, 2-6 each with a dark spot on lateral fourth near anterior margin. Styli and right phallomere reddish brown; left phallomere and left paraproct pale brown; right paraproct dark brown anteriorly, pale on posterior margin of brown tooth.

Measurements: Length of body 22 mm., of pronotum 5.3 mm., of tegmen 24.5 mm., of middle tibia 5.7 mm.; width of pronotum 6.5 mm.

Type locality.—Espírito Santo, Brazil.

Type.—No. 53131 U. S. National Museum.

Only the male holotype is known.

***Xestoblatta castanea* Hebard.**

Xestoblatta castanea Hebard, Proc. Acad. Nat. Sci. Phila., Vol. 78, pp. 184–185, 1926.

Only the type of this very dark, rather large species is known. Its relationship to other species remains uncertain until the male is discovered.

The interocular space is broad (1.2 mm. at narrowest point), widening gradually toward the interocellar area. The tegmina and wings exceed the abdomen by a distance equal to the pronotal length. The eighth tergum has a heavy, rounded, marginal projection at each side.

Material examined: St. Jean du Maroni, French Guiana, 1 female (type).

***Xestoblatta hoplites* Hebard.**

Figs. 28, 43, 47, 48.

Xestoblatta festae (Giglio-Tos) (in part), Hebard, Trans. Amer. Ent. Soc., Vol. 42, pp. 377–379, pl. 19, figs. 8–11, 1916.

Xestoblatta hoplites Hebard, Trans. Amer. Ent. Soc., Vol. 47, p. 127, 1921.

The male was described by Hebard (1916) under the name *festae*, but the later association of sexes of *festae* made necessary the giving of a new name.

Male.—This sex has been described by Hebard (1916); the specialization of the subgenital plate is rather different from that of any other known species, but the specialized lateral margins of the seventh tergum (fig. 28) and the general form of the insect show relationship to *hamata*. The subgenital plate bears three teeth along its lateral margin (fig. 43); the left stylus is strongly curved and acute; the right stylus (fig. 47 in dorsal view) is borne on an incurved fold at the postero-lateral angle of the subgenital plate.

Female.—General form robust, in general agreement with male. Interocular space rather wide (average width 1.4 mm.), distinctly narrowed posteriorly. Five complete and 6 incomplete rami of ulnar vein of wing; supra-anal plate short, bilobate at apex; subgenital plate as in *hamata*.

Coloration: About as in *festae*; interocular space chestnut, not sharply delimited from the interocellar area; subgenital plate as in *hamata*.

Measurements: Length of pronotum 5.7 mm., of tegmen 23.5 mm., of hind tibia 9.6 mm.; width of pronotum 7.4 mm. (Abdomen preserved separately from body.)

Material examined: Borders of the Rio Machuca (Proc.), Costa Rica, 150 meters, January, 1907 (P. Biolley), 1 male

(type); Costa Rica (U. S. N. M.), 1 female; Costa Rica, in quarantine at Seattle, Wash., December, 1934 (U. S. N. M.), 1 broken female.

Xestoblatta sancta (Giglio-Tos).

Fig. 3.

Ischnoptera sancta Giglio-Tos, Boll. Mus. Zool. Anat. Comp. Univ. Torino, Vol. 13, No. 311, pp. 3-6, 1898.

This insect, especially in the coloration of the pronotum, superficially resembles an *Epilampra* even more than does *festae*, which was originally described as a member of that genus. Hebard (1916) first assigned *sancta* to *Xestoblatta* and later (1924, p. 124) gave descriptive notes when recording the two specimens reported below. In the specimen from Chaguarapata the discoidal vein of the wing is forked well beyond the middle; the ulnar vein has 5 complete and 5 incomplete rami. The species was originally described from 5 females from San José, Ecuador.

Material examined: Chaguarapata, Chimborazo, Ecuador, April 5, 1922, 2,390 ft. (G. H. Tate), 1 female; Pasaje, Del Oro, Ecuador (F. Campos R.), 1 female.

Xestoblatta hamata (Giglio-Tos).

Figs. 27, 41, 70.

Ischnoptera hamata Giglio-Tos, Boll. Mus. Zool. Anat. Comp. Univ. Torino, Vol. 13, No. 311, pp. 3-5, 1898.

Hebard assigned *hamata* to *Xestoblatta* in 1916, and in 1921 he recorded two females from Colombia. Giglio-Tos had two females from Santiago, Ecuador, and one male from Gualaquiza, Ecuador. Giglio-Tos' brief description of the male abdomen is insufficient to identify the present Panamanian male with certainty. The Panamanian female agrees closely with the Colombian females identified as *hamata* by Hebard.

In habitus and coloration *hamata* agrees with *hoplites* and *festae*; it differs from *hoplites* in the male specializations and in the narrower interocular space of the female, and differs from *festae* in its greater size and very different male characters.

Male.—Interocular space widest anteriorly; average width 0.8 mm., lateral margins slightly converging posteriorly. No prominent facial ridge. Ulnar vein of wing with 5 rami reaching margin of wing and 6 incomplete ones. First abdominal tergum weakly specialized, with strong folds diverging caudo-laterad from median point of anterior margin, the latter bearing setae medially one-third the longitudinal width of segment, a small whitish area of weaker sclerotization in median part of tergum. Terga 5-10 as in fig. 27; 5 and 6 not notice-

ably modified; tergum 7 greatly modified about as in *hoplites* (fig. 28), the lateral margins with narrow area elevated in a higher plane than other portions of tergite; tergum 7 with transverse glandular depression partially covered by a shelf-like portion which is itself largely concealed by the sixth tergum and which superficially resembles a separate tergum; eighth tergum with caudo-lateral angles broadly rounded; ninth with posterior margin deeply and broadly emarginate; supra-anal plate broad at apex, emarginate.

Subgenital plate (fig. 41) broadly emarginate at apex; a less heavily sclerotized plate originating at a point dorsad of the emargination; left stylus with small lateral arm midway of its length; right stylus visible in caudal view, borne on incurved fold at postero-lateral angle of subgenital plate, consisting of slender arm directed mesad, bearing several sharp teeth at apex; right paraproct (fig. 70) with prominent and smoothly rounded postero-mesal angle, posterior margin with single, heavy, curved tooth, two additional teeth projecting from beneath margin (left paraproct not clearly visible in present specimen).

Coloration: Interocular space pale reddish brown; subgenital plate chestnut brown; styli and right paraproct brown; color elsewhere very much as in *festae*.

Measurements: Length of body 19 mm., of pronotum 5 mm., of tegmen 22 mm., of hind tibia 9 mm.; width of pronotum 6.5 mm.

Female (Panama).—General form as in male, size slightly larger; interocular space with average width 1 mm.; supra-anal plate more triangular than in male, emarginate at apex; subgenital plate simple, broad at apex, with incurved apical margin.

Coloration: As in male; subgenital plate very dark brown in apical fourth.

Measurements: Length of body 22 mm., of pronotum 5.8 mm., of tegmen 25 mm., of hind tibia 10 mm.; width of pronotum 7 mm.

The Colombian female does not differ materially from the Panamanian one. The ulnar vein of wing has 5 complete and 5 incomplete rami. The measurements are as follows: Length of body 23.5 mm., of pronotum 5.8 mm., of tegmen 25 mm., of hind tibia 10.3 mm.; width of pronotum 7.6 mm.

Xestoblatta hamata may have been carried by winds from the mainland of southwestern Colombia to Gorgona Island, a distance of about 30 miles.

Material examined: Andagoya, Antioquia, Colombia, April 22, 1918 (M. A. Carriker, Jr.), 2 females; Gorgona Island, 2.59° N., 78.20° W., July, 1924 (Miss Cheesman), 1 female; Barro Colorado Island, Panama, December 1936–January, 1937 (Zetek) (U. S. N. M.), 1 male, 1 female.

Xestoblatta immaculata Hebard.

Figs. 4, 13, 46, 60, 73.

Xestoblatta immaculata Hebard, Mem. Amer. Ent. Soc., No. 4, pp. 80–81, pl. 4, fig. 16, 1920.

This species may be recognized from other described species of *Xestoblatta* by the very broad form, especially of the pronotum, the unusual shape of the interocular space, the immaculate surface, and the light-chestnut ground color. The male subgenital plate, styli, and phallomeres, first described by Caudell (1924,

pl. 4, figs. a and b), are distinctive of the species. The left paraproct (fig. 60) is a concave plate with broadly rounded posterior margin; from the posterior half of the disk a slender, gently curved spine extends mesad. The right paraproct (fig. 73) is an undulating plate greatly thickened along the postero-lateral margin; a strong, sharp spine projects postero-mesad. The first abdominal tergum (fig. 13) is specialized in the form of a bilobate pit; there is a longitudinal ridge dividing the lateral halves and each has a tuft of setæ extending posteriorly over the swollen and smoothly rounded margin.

The tergal specialization, paraprocts, interocular space, and general habitus of *immaculata* suggest that the species belongs to a *Xestoblatta* stock which is rather far apart from the other species. The male recorded below from Pará agrees with Panamanian males and indicates a much wider distribution for the species than had previously been supposed.

Material examined: Alhajuela, Panama, March 10, 1912 (A. Busck) (U. S. N. M.), 1 female (type); Rio Chilibrillo, Panama, bat caves, August 24, 1923 (R. C. Shannon) (U. S. N. M.), 1 female, 1 nymph; same data, August 20, 1923, August 29, 1933, 1 male, 1 female; Chilibre River, Panama, August 29, 1923 (Zetek), 1 female; Porto Bello, Panama, February 28, 1911 (A. Busck) (U. S. N. M.), 1 nymph; same data, April 20, 1912, 1 nymph; Barro Colorado Island, Panama, June, 1937 (Zetek) (U. S. N. M.), 2 males; Pará, Pará, Brazil, July 20, 1926 (de Schauensee and Bond), 1 male.

SUMMARY.

Xestoblatta is known to include 20 species, of which 8 are here described as new. The diagnostic characters of the species, especially of the males, are discussed and illustrated. In addition to their importance in identification, these features suggest the natural lines of evolution within the genus. Notes on allied genera, the generic limits of *Xestoblatta*, and the biology and distribution of the species are presented.

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EXPLANATION OF PLATES.

Plate 13.

Fig. 1. *Xestoblatta carrikeri* Hebard. Outline of wing. *CM*, costal margin; *C*, costal veins; *IT*, intercalated triangle; *Ax*, axillary vein; *M*, median vein; *A*, anal vein; *FD*, fork of discoidal vein; *D*, discoidal vein; *U*, ulnar vein; *Ms*, mediastine vein; *P*, peripheral margin; *R*, radiate veins. (After Hebard, 1916.)

Fig. 2. *X. para* Hebard, male. Anterior view of front femur. (After Hebard, 1916.)

Fig. 3. *X. sancta* (Giglio-Tos), female. Interocular space, dorso-anterior view. Chaguarapata, Ecuador.

Fig. 4. *X. immaculata* Hebard, female. Interocular space, dorso-anterior view. Rio Chilibrillo, Panama, August 29, 1923.

Fig. 5. *X. poecila* Hebard. Dorsal view of pronotum. (Redrawn from Hebard, 1921b.)

Fig. 6. *X. ramona*, new species. Dorsal view of pronotum. Holotype.

Fig. 7. *X. braziliae*, new species. Dorsal view of pronotum.

Fig. 8. *X. para* Hebard, male. Dorsal view of pronotum. Rio Purus, Brazil.

Fig. 9. *X. braziliae*, new species. Dorsal view of pronotum.

Fig. 10. *X. para* Hebard, male. Dorsal view of apical portion of abdomen. *A*. Seventh tergum. (After Hebard, 1916.)

Fig. 11. *X. carrikeri* Hebard, male. Same view. *A*, Depressed median specialization of seventh tergum; the eighth is concealed. (After Hebard, 1916.)

PLATE 14.

Fig. 12. *X. zeteki* (Saussure), male. Dorsal view of apical portion of abdomen.

Fig. 13. *X. immaculata* Hebard, male. Dorsal view of mesal portion of first tergum, showing bilobed depression along anterior margin.

Fig. 14. *X. panamae*, new species, male. Dorsal view of apical portion of abdomen. Holotype.

Fig. 15. *X. peruana* (Saussure), male. Same view.

Fig. 16. *X. ecuadorana*, new species, male. Caudal view of subgenital plate.

Fig. 17. *X. mira* Hebard, male. Caudal view of subgenital plate. (After Hebard, 1921b.)

Fig. 18. *X. mira*, new species, male. Dorsal view of apical portion of left paraproct.

Fig. 19. *X. ecuadorana*, new species, male. Dorsal view of apical portion of abdomen.

Fig. 20. *X. potrix*, new species, male. Same view. Tergum 8 concealed.

Fig. 21. *X. braziliae*, new species, male. Same view.

Fig. 22. *X. mira*, new species, male. Same view.

Fig. 23. *X. micra* Hebard, male. Same view.

Fig. 24. *X. carrikeri* Hebard, male. Caudal view of subgenital plate. (After Hebard, 1916.)

Fig. 25. *X. festae* (Griffini), male. Dorsal view of apical portion of abdomen. Barro Colorado Island, Panama, August-September, 1936.

Plate 15.

Fig. 26. *X. ramona*, new species, male. Dorsal view of apical portion of abdomen. Holotype.

Fig. 27. *X. hamata* (Giglio-Tos), male. Same view. Barro Colorado Island, Panama.

Fig. 28. *X. hoplites* Hebard, male. Same view. *A*, Latero-posterior production of seventh tergum.² (After Hebard, 1916.)

Fig. 29. *X. zeteki*, new species, male. Ventro-caudal view of subgenital plate.

Fig. 30. *X. nyctiboroides* (Rehn), male. Caudal view of subgenital plate. (Redrawn from Hebard, 1926.)

Fig. 31. *X. para* Hebard, male. Caudal view of subgenital plate. (After Hebard, 1916.)

Fig. 32. *X. panamae*, new species, male. Ventro-caudal view of subgenital plate. Paratype. Barro Colorado Island, Panama, September-October, 1937

Fig. 33. *X. potrix*, new species, male. Caudal view of subgenital plate.

Fig. 34. *X. mira*, new species, male. Same view.

Fig. 35. *X. peruana* (Saussure), male. Same view.

Fig. 36. *X. buscki*, new species, male. Dorsal view of apical portion of abdomen. Holotype.

Plate 16.

Fig. 37. *X. ramona*, new species, male. Ventral view of apical portion of abdomen. Holotype.

Fig. 38. *X. potrix*, new species, male. Dorsal view of right stylus and associated structures.

Fig. 39. *X. panamae*, new species, male. Caudal view of right stylus. Same specimen as in fig. 32.

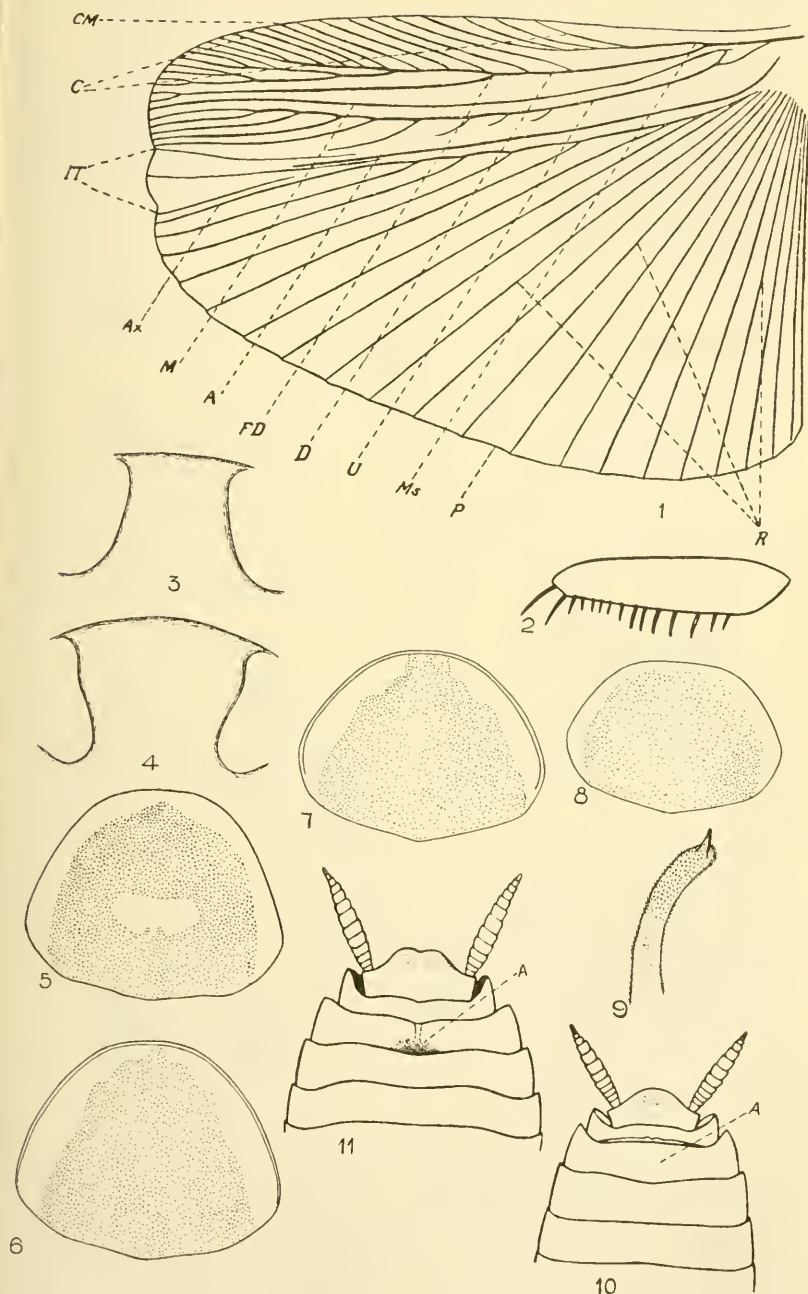
Fig. 40. *X. braziliae*, new species, male. Ventral view of apical portion of abdomen.

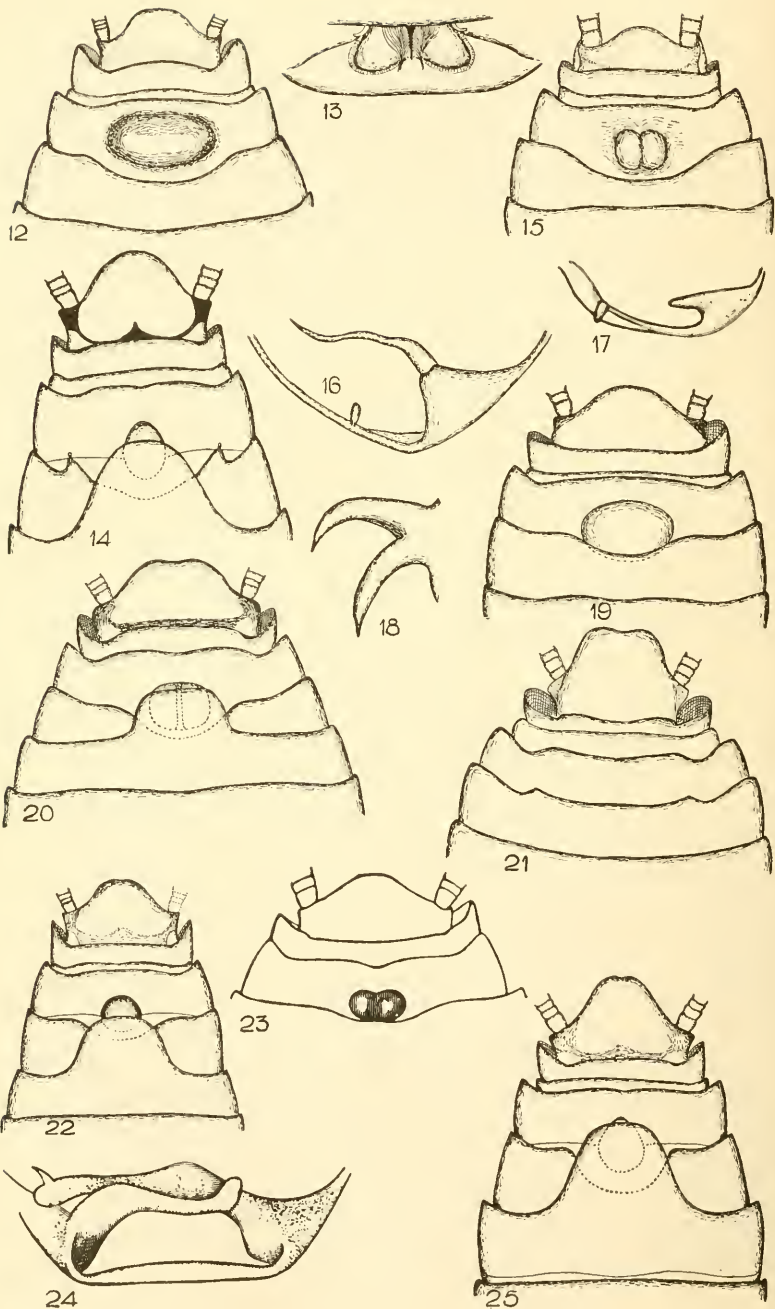
Fig. 41. *X. hamata* (Giglio-Tos), male. Ventral view of apical portion of abdomen.

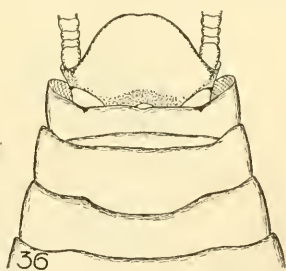
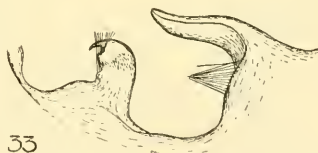
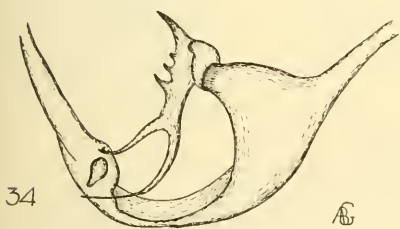
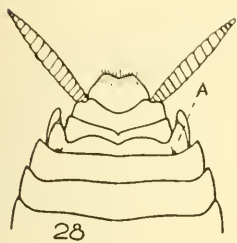
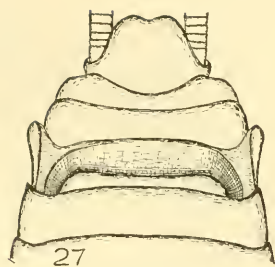
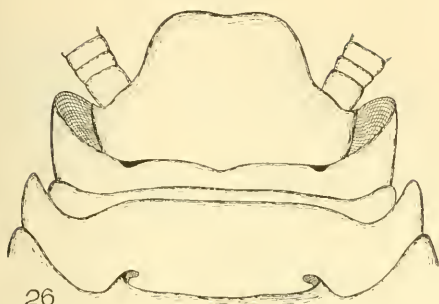
Fig. 42. *X. buscki*, new species, male. Same view. Paratype. Barro Colorado Island, Panama, June, 1937.

Fig. 43. *X. hoplites* Hebard, male. Caudal view of left stylus and left lateral margin of subgenital plate, showing the armament of that margin. (After Hebard, 1916.)

² As noted elsewhere, the writer has chosen to drop the use of the term "median segment" for the first segment of the abdomen; because of this fact the nomenclature of the segments does not agree with that used in Hebard's descriptions.







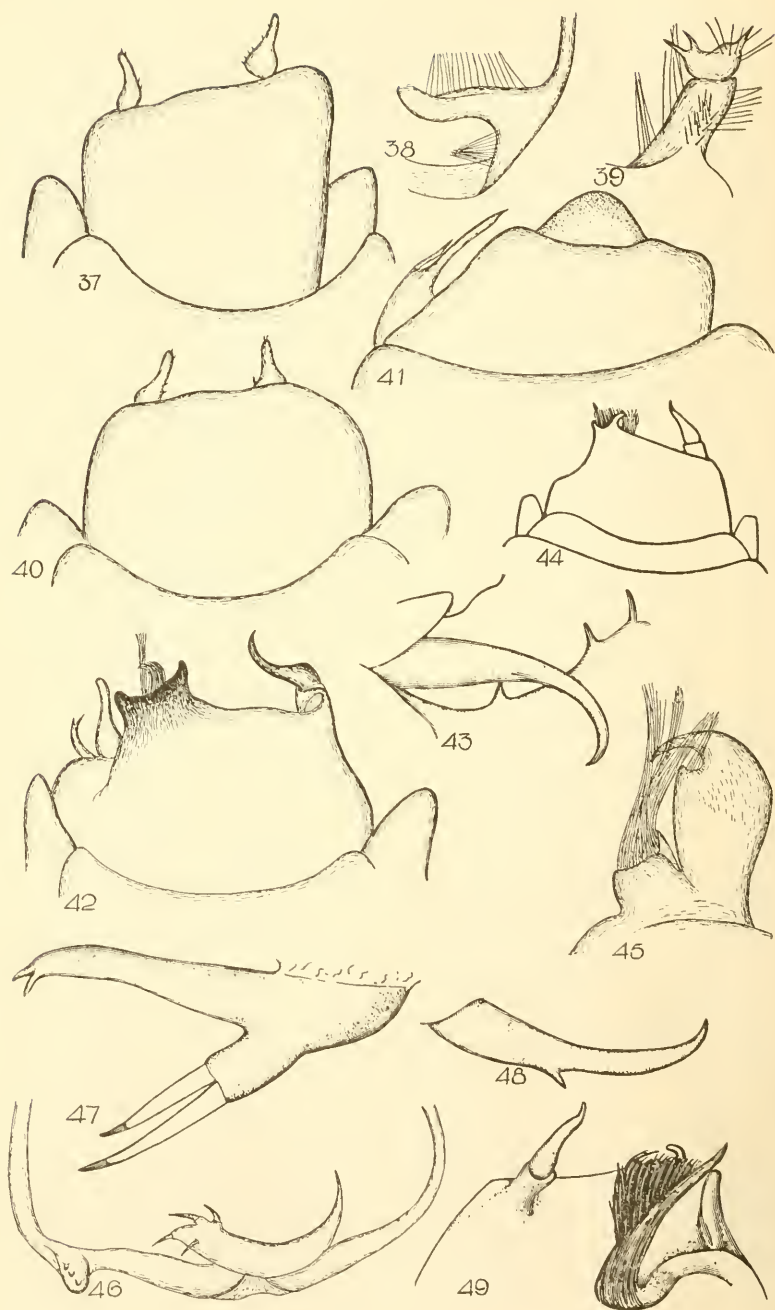




Fig. 44. *X. festae* (Griffini), male. Ventral view of apical portion of abdomen. (After Hebard, 1921b.)

Fig. 45. *X. potrix*, new species, male. Latero-caudal view of left stylus.

Fig. 46. *X. immaculata* Hebard, male. Caudal view of subgenital plate.

Fig. 47. *X. hoplites* Hebard, male. Caudal view of right stylus. (After Hebard, 1916.)

Fig. 48. *X. hoplites* Hebard, male. Dorsal view of left stylus. (After Hebard, 1916.)

Fig. 49. *X. festae* (Griffini), male. Dorsal view of apical portion of subgenital plate. (After Hebard, 1916.)

Plate 17.

Fig. 50. *X. ecuadorana*, new species, male. Dorsal view of apical portion of left paraproct.

Fig. 51. *X. potrix*, new species, male. Same view.

Fig. 52. *X. zeteki*, new species, male. Same view.

Fig. 53. *X. panamae*, new species, male. Same view. Holotype.

Fig. 54. Same. Same view. Paratype. Barro Colorado Island, Panama, September-October, 1937.

Fig. 55. Same. Same view. Paratype. Same data as in fig. 54.

Fig. 56. *X. micra* Hebard, male. Same view.

Fig. 57. *X. peruana* (Saussure), male. Same view.

Fig. 58. *X. braziliae*, new species, male. Same view.

Fig. 59. *X. ramona*, new species, male. Same view. Holotype.

Fig. 60. *X. immaculata* Hebard, male. Same view. Barro Colorado Island, Panama, June, 1937.

Fig. 61. *X. zeteki*, new species, male. Dorsal view of posterior portion of right paraproct.

Fig. 62. *X. ecuadorana*, new species, male. Same view.

Fig. 63. *X. micra* Hebard, male. Same view.

Fig. 64. *X. peruana* (Saussure), male. Same view.

Fig. 65. *X. potrix*, new species, male. Same view.

Fig. 66. *X. mira*, new species, male. Same view.

Fig. 67. *X. panamae*, new species, male. Same view. Same specimen as in fig. 55.

Fig. 68. *X. festae* (Griffini), male. Same view. Barro Colorado Island, Panama, August-September, 1936.

Figure 69. *X. buscki*, new species, male. Same view. Paratype. Barro Colorado Island, Panama, June, 1937.

Fig. 70. *X. hamata* (Giglio-Tos), male. Same view.

Fig. 71. *X. ramona*, new species, male. Same view. Holotype.

Fig. 72. *X. braziliae*, new species, male. Same view.

Fig. 73. *X. immaculata* Hebard, male. Same view.

(Figures 5-8 drawn by Mary Foley Benson.)